

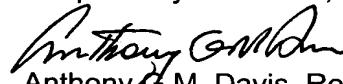
REMARKS

Accompanying this response, please find marked-up paragraphs of the specification which overcome some informalities noted in the specification. The undersigned avers that the enclosed replacement paragraph(s) of the specification do not contain any new matter.

Please consider new claims 13-24 upon consideration of this application.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,



Anthony G.M. Davis, Reg. No. 27,868
Customer No. 020210
Davis & Bujold, P.L.L.C.
Fourth Floor
500 North Commercial Street
Manchester NH 03101-1151
Telephone 603-624-9220
Facsimile 603-624-9229
E-mail: patent@davisandbujold.com

[001] CONTINUOUSLY VARIABLE VEHICLE TRANSMISSION

[002] **FIELD OF THE INVENTION**

[003] The invention relates to a continuously variable vehicle transmission having one variator such as a toroidal drive or a cone pulley belt drive for continuously variable ratio and a multi-step transmission having at least one input and one output shaft and at least two forward gears and at least one reverse gear.

[004] **BACKGROUND OF THE INVENTION**

[005] A similar arrangement is known from the Applicant's DE 198 58 553. It discloses a combination of one variator, one planetary transmission and a rear-mounted differential which distributes the driving power over two drive shafts. The power is branched behind the transmission input via a first branch to the variator and via a second branch and one other ratio step to the planetary transmission.

[006] Vehicle transmissions of that kind are also known, in general, from the prior art where a planetary transmission is rear-mounted on the continuously variable transmission, for example, a belt drive transmission. Said planetary transmissions are usually connected via two other spur gear sets with the axle differential of a motor vehicle, since the input and the output shafts of the planetary transmission have the same positive direction of rotation for the forward drive range and the positive direction of rotation is relayed via the inserted spur gear sets so that the drive axles connected with the axle differential also effect a positive direction of rotation during forward drive of the motor vehicle.

[007] Vehicle transmission of that kind are subject to a constant further development regarding reduction of construction cost or increase of comfort for the user of a motor vehicle equipped with such a transmission.

[008] It is, therefore, the problem on which this invention is based to indicate a design of a vehicle transmission which makes possible, on one hand, a lower construction cost and, on the other, an increase of comfort for the driver of a vehicle equipped with such a transmission. The reliability and the service life of the transmission are also to be increased.

[009] ~~According to the invention this problem is solved by a continuously variable vehicle transmission according to the characteristic features of claim 1.~~

[010] **SUMMARY OF THE INVENTION**

[011] It is proposed, in a vehicle transmission of the above kind, that between the input and the output shafts of the multi-step transmission a reversal of direction of rotation takes place by means of at least two forward gears and that the reverse gear(s) be designed without reversal of direction of rotation between the input and the output shafts of the transmission. Thereby is obtained in the first place that an advantageously lower construction cost be required compared to the known vehicle transmission with two driving ranges. By virtue of the reversal of direction of rotation within the transmission between the input and the output shafts, the formerly double spur gear set between the transmission and the rear-mounted axle differential is reduced to a single spur gear set. Secondly, the invention proposes a solution which makes possible a lesser variator spreading with a larger total spreading compared to one-range transmissions. Besides, an optimum variator rotational speed is possible in the main drive ranges which are divided, for example, in a city and a cross-country range.

[012] In a specially advantageous development of the invention, it is proposed that a variator is specially provided a cone pulley belt drive transmission or a reversing toroidal drive wherein the input and output shafts of the variator have the same direction of rotation and on the multi-step transmission there is rear-mounted, for reversal of direction of rotation, a device such as a simple spur gear set with a rotational speed ratio. Thereby the negative direction of rotation of the output shaft of the transmission during forward drive of the motor vehicle is, on one hand, reversed to a positive direction of rotation and, on the other, a rotational speed ratio is made possible, at the same time, by said spur gear set.

[013] The shafts of the variator and the multi-step transmission, the same as the wheel axles connected with the axle differential, are disposed side by side in parallel. Thereby a compact construction is advantageously made possible.

[020] It is advantageously provided to effect a change of the drive range as compound shift so that a stepped shift in the multi-step transmission and a ratio adjustment of the variator simultaneously occur. Thus, when shifting, for example, from the first to the second range, a shifting is effected wherein the total ratio of the vehicle transmission remains constant.

[021] **BRIEF DESCRIPTION OF THE DRAWINGS**

[022] Other objectives, features, advantages and possible application of the invention result from the description that follows of the embodiments shown in more detail in the drawings. All described and/or graphically shown features per se or in any logical combination form the object of the invention independently of their compilation in the claims and their reference to previous claims. In the drawings

[022] **The invention will now be described, by way of example, with reference to the accompanying drawings in which:**

[023] Fig. 1 diagrammatically shows a continuously variable vehicle transmission with a belt drive transmission and a rear-mounted transmission;

[024] Fig. 2 diagrammatically shows a continuously variable vehicle transmission with a two-way toroidal drive and a rear-mounted transmission;

[025] Fig. 3 shows a continuously variable vehicle transmission with a one-way toroidal drive and a rear-mounted transmission, the same as an axle differential;

[026] Fig. 4 shows a transmission similar to the representation in Fig. 1 but with a detailed diagrammatic representation of the planetary transmission;

[027] Fig. 5 shows the switching system for a planetary transmission according to the representation in Fig. 1; and

[028] Fig. 6 shows a graphic representation of the variator ratio relative to the total ratio for the three drive ranges.

[029] **DETAILED DESCRIPTION OF THE INVENTION**

[030] The continuously variable vehicle transmission 1 (Fig. 1) consists of one belt-drive transmission 2 as variator and rear-mounted thereon one multi-step